

1998 Progress Report

Implementation of Suisun Marsh Mitigation Facilities

Suisun Marsh Branch
Environmental Services Office
Department of Water Resources

April 1999

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INTRODUCTION

In compliance with Term 7(d) of State Water Resources Control Board Decision 1485 (as amended by Order WR 95-6 and temporarily modified by the October 30, 1997 Order), this is a progress report of mitigation by the Department of Water Resources and the U.S. Bureau of Reclamation during calendar year 1998 to offset the impacts of the State Water Project and the federal Central Valley Project on Suisun Marsh channel water salinity.

Figure 1 is an overview of the Marsh indicating locations of compliance and monitoring stations.

PLANNING

Suisun Marsh Preservation Agreement Activities

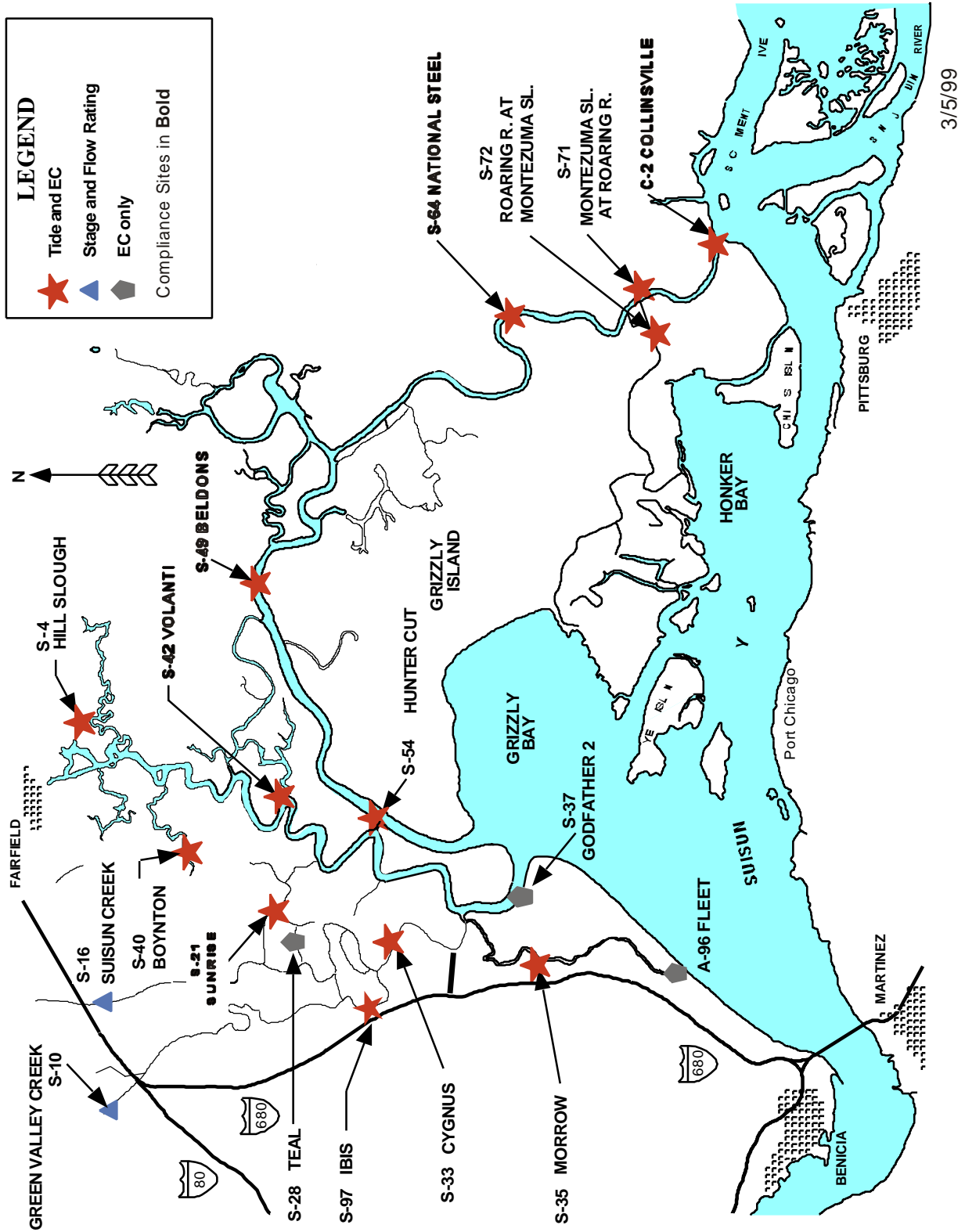
Amending the Agreement

The purpose of Amendment Three is to change the SMPA to provide equivalent or better protection to Suisun Marsh managed wetlands as intended under the original agreement. Amendment Three will also make the channel water salinity standards consistent with the SWRCB's 1995 Water Quality Control Plan.

Amendment Three of the SMPA would update and replace the original agreement. Provisions included in the original SMPA and agreed to in the proposed Third Amendment, provides or funds facilities or activities that mitigate effects of reduced Delta outflow caused by SWP and CVP operations and other upstream diverters. Amendment Three would replace large-scale facilities with water and land management actions on managed wetlands to meet the objectives of the original agreement. Amendment three actions are described in detail in the Draft Environmental Assessment and Initial Study prepared by the SMPA parties (June 1998).

In the original agreement, SMPA parties agreed to limit its provisions primarily to managed wetlands. However, when the mitigation agreement is updated, it will broaden potential mitigation activities to include restoration of tidal wetlands. In addition, the undiked wetlands may be considered in other forums or agreements, such as the SWRCB water quality control planning for the Delta, CALFED, USFWS Tidal Marsh Recovery Plan, and Regional Wetland Habitat Goals Project. Other legal and administrative forums addressing the Suisun Marsh are discussed in detail in the Draft Environmental Assessment and Initial Study for SMPA Amendment Three.

Figure 1. Suisun Marsh Continuous Compliance and Monitoring Stations



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In addition, Amendment Three incorporates channel water salinity standards in the Marsh similar to those under the original agreement, and consistent with the SWRCB's terms and conditions in DWR and USBR water rights permits for the SWP and CVP. At the same time, actions in Amendment Three would provide equivalent or better protection to the western Marsh than the SWRCB channel water salinity objectives for stations S-35 and S-97 as described in the Demonstration Document (DWR 1998).

Amendment Three also requires amending and revising the monitoring agreement. Any monitoring required as part of the new actions would be included in the updated agreement. The Suisun Resource Conservation District (SRCD) will be included as a participant in the new monitoring program. The monitoring agreement will be amended after Amendment Three is finalized and signed by the four SMPA parties.

Before finalizing the Draft Environmental Assessment/Initial Study, the parties will formally consult with the USFWS, pursuant to Section 7 of the Endangered Species Act, to obtain a biological opinion on potential impacts of Amendment Three on endangered species. The parties intend to initiate formal consultation in Summer 1999 with the goal of obtaining a draft biological opinion during Fall 1999. After receipt of public comment of the Draft Environmental Assessment/Initial Study and the biological opinion, the Suisun Marsh Preservation Agreement parties may need to revise Amendment Three and the Draft Environmental Assessment/Initial Study to address any new information or environmental impacts unknown at this time. The parties plan to receive a final a final Biological Assessment and sign Amendment Three by the end of 1999.

SMPA Environmental Coordination Advisory Team

The Suisun Marsh Preservation Agreement Environmental Coordination Advisory Team (ECAT) was convened to ensure compliance with mitigation and monitoring responsibilities specified in the Suisun Marsh Preservation Agreement. ECAT includes staff from DWR, USBR, DFG Grizzly Island, DFG Central Valley Bay-Delta Branch, and SRCD. USFWS, NMFS, and USACE staff participate on the ECAT in an advisory role.

ECAT documents compliance with biological opinion measures and permit terms, and provides reports to the SMPA Coordinators. ECAT will play a significant role in implementing an amended Suisun Marsh Mitigation Agreement as part of the Amendment Three process. ECAT will coordinate preconstruction inspections as specified in Amendment Three for the Wetland Management Program, Joint-Use Facilities, and Portable Pumps activities. ECAT will also provide guidance to the Water Manager Program, which, as specified in the duties of the Water Manager Program, will advise landowners on management practices that benefit endangered species.

Individual Ownership Cost Share Program

The Individual Ownership Cost Share Program is a component of the Suisun Marsh Preservation Agreement designed to assist individual landowners with water management on privately owned land within the Suisun Marsh. Funded projects include replacing, lowering, and/or enlarging drainage structures, and the purchase of pumps to assist drainage. The program began in 1987 with a 50 percent reimbursement by DWR and USBR. Participation in the program, however, has greatly increased since 1994 when the SMPA Coordinators increased retroactively the DWR and USBR reimbursement to 75 percent.

Two applications for water management projects were submitted and paid for during 1998. The total cost of these improvements was \$46,633, of which \$39,936 was paid to SRCD and distributed to the landowners. SRCD has seven additional applications for work that were completed in 1998, and is expected to forward these applications to DWR and USBR for reimbursement during early 1999. DWR and USBR have paid a total of \$1,192,239 since the program began in 1987.

Lower Joice Island Fish Screen

The SRCD and the landowner accepted the installed fish screen at the Lower Joice Island diversion on September 9, 1998. DWR, under contract with the Suisun Resource Conservation District, installed the 12-foot diameter conical fish screen on the Montezuma Slough intake to private ownership number 424 on Lower Joice Island during 1997. This intake was constructed in 1990 and permit conditions required that a fish screen be installed. The installation of mitigation facilities for the Cygnus and Lower Joice Island unit is described in the 1991 Progress Report, Implementation of Suisun Marsh Mitigation Facilities. The total construction and installation cost of the Lower Joice Island Fish Screen was \$403,400. The contract for construction of the screen specifies a 12-month warranty period, once accepted by the SRCD, where any needed maintenance or repairs will be the responsibility of the contractor, Borcalli and Associates. After this 12-month period, the landowner will own the screen and be responsible for all operations and maintenance for the life of the fish screen.

SWRCB Water Rights Hearings

The SWRCB has included the SMPA management actions specified in Amendment Three as an alternative in its Draft EIR for implementing the 1995 Bay/Delta Plan. During the Water Rights Hearing for implementing the 1995 Bay/Delta Plan which began on July 1, 1998, the SMPA parties recommended that the SWRCB select these actions as the next step in implementing the objectives for Suisun Marsh managed wetlands.

Suisun Ecological Workgroup

In the 1995 Bay/Delta Plan, the SWRCB directed DWR to convene an interagency work group to evaluate the technical basis of the Suisun Marsh water quality objectives and their effects on beneficial uses. Consequently, the Suisun Ecological Workgroup (SEW) was formed in May 1995, with the purpose of recommending salinity objectives protective of the beneficial uses of the Suisun Marsh. SEW began this process by evaluating the impact of various salinity regimes on ecosystem components, such as brackish marsh vegetation, wildlife, waterfowl and fish. Findings from these evaluations, which included identification of significant data gaps, recommendations for long term monitoring programs, and special studies, were presented at an all-day workshop in March 1998.

In May 1998, SEW participants began examining the effect of various salinity regimes on the Marsh ecosystem as a whole. Of primary interest to many SEW participants was evaluation of the impacts of increasing the variability of the salinity regime in the Suisun Marsh. Some participants have suggested that a more variable salinity regime might match historic conditions more closely, thus supporting native species and possibly promoting species diversity by decreasing the abundance of nonnative species that can establish competitive dominance. Concern exists, however, that the Marsh has been altered to such an extent that an increase in variability of the salinity regime may not have this beneficial effect and may negatively impact the managed wetlands in the Marsh. To evaluate these issues, SEW examined and compared alternative salinity regimes. The main components of the alternatives evaluated are:

- (1) Current Suisun Marsh conditions (X2 standard, Suisun Marsh Salinity Control Gate operation, numeric standards for the interior Marsh)
- (2) Current Suisun Marsh conditions, with actions in the proposed Suisun Marsh Preservation Agreement (SMPA) Amendment Three
- (3) X2 standard with SMPA Amendment Three limited to management actions and limited SMSCG operations; and
- (4) X2 standard, with limited SMSCG operations and no interior Marsh numeric salinity standards.

The group evaluated DWR model studies that simulated flow and salinity in the Suisun Marsh with and without SMSCG operations as part of this process.

SEW initially intended to recommend several alternatives for salinity objectives, agreed on by the group as a whole, which would be protective of most beneficial uses in the Marsh. After debating the potential impacts of various salinity regimes on the physical and biological aspects of the ecosystem, however, it became

apparent that the most productive approach was for each resource-based subcommittee to produce its own set of recommendations and to comment on the recommendations of other committees. The report to the SWRCB will include these different recommendations and highlight common areas among the recommendations.

Since May 1998, subcommittees have focused on producing recommendations and drafting their subcommittee chapters, which will be included in SEW's final report to the SWRCB. These subcommittee chapters will be distributed for internal review by February 1999. In May 1999, a compiled draft report, containing all chapters and recommendations by each subcommittee, will be distributed for technical peer review. The final SEW report will be submitted to the SWRCB in June 1999 as specified in Order WR 98-9, with a recommendation for a SWRCB-sponsored workshop for public input. Additionally, all scientific literature used in subcommittee chapters may be compiled electronically and submitted to the SWRCB along with SEW's final report.

Modeling Support

SWRCB 1995 Water Quality Control Plan Draft Environmental Impact Report

DWR Suisun Marsh Planning staff completed a modeling analysis of the salinity impacts of the 1995 Water Quality Control Plan in support of the SWRCB Draft EIR to implement the plan. The report covers six alternatives for salinity control in the Marsh, including the management actions proposed under the SMPA Amendment Three process. Since completion of the Draft EIR, the Amendment management actions have changed. Augmentation of Green Valley Creek (GVC) from Fairfield Treatment Plant effluent was found institutionally infeasible at this time. The four parties to the SMPA modified the management actions, dropping the GVC augmentation and adding a drought response fund in its place. Since Alternative 5 of the modeling report included GVC augmentation as an SMPA management action, it was modified to reflect the current actions. Alternative 5 has been re-run to reflect 1995 WQCP standards and flows, and allow for September operation of the Suisun Marsh Salinity Control Gate. The modeling results are being postprocessed, and an addendum to DWR's modeling report will be prepared for the Board before Phase 8 of the Water Rights Hearings in 1999.

Suisun Ecological Work Group

In 1998, Suisun Marsh Planning staff provided hydrodynamic and water quality expertise, participated in SEW meetings, and actively participating on the SEW Aquatic Habitat Subcommittee (SEWAH). In addition to providing input to the

SEWAH data analysis and recommendation process, Suisun Marsh Planning staff performed a statistical study of the correlation between fish abundance in the Suisun Marsh and the location of X2 in Montezuma Slough.

CALFED Suisun Marsh Levee Breach Investigation

The CALFED Bay-Delta program is developing information on the costs and benefits of including Suisun Marsh levees in CALFED's Levee System Integrity Program, and how it would relate to CALFED objectives. A sub-team of the CALFED Levees and Channels Committee was formed to develop this information using modeling analysis and mapping. Twenty-eight individual two-year modeling simulations have been identified to investigate the hydrodynamics and salinity impact of levee breaches to create shallow water habitat and tidal marsh consistent with CALFED ecosystem restoration goals.

CALFED is considering protection of Suisun Marsh levee integrity for two primary reasons:

1. Protection of the exterior levees in the Suisun Marsh sustains seasonal wetland values provided by the Marsh's public and private managed wetlands.
2. Maintenance of Suisun Marsh levee integrity ensures that conversion of managed wetlands to tidal wetlands or bayland shallow water habitat will not be due to levee failure, but instead will be planned with consideration of land owner support, Ecosystem Restoration Program (ERP) targets, regional wetlands habitat goals, and endangered species recovery plans.

During the first week of February 1998, about 22,000 of the 57,000 acres of the managed wetlands in Suisun Marsh were flooded (see Suisun Marsh Levees section, below). The tidal prism in the Marsh was expanded by about 85,000 acre feet, roughly 40% of the volume of Suisun Bay by comparison. DWR and USBR repaired the 11 exterior levee breaches at a cost of about \$1.1 million with the intent to protect the approximately \$80 million program/infrastructure, maintain the ability to meet Suisun Marsh salinity standards, and protect Suisun Marsh and Delta water quality.

In 1998, the DWR Suisun Marsh Planning Section conducted a hydrodynamics and salinity modeling analysis to evaluate the potential impacts on the Marsh and Delta if the Suisun Marsh levee breaches were not repaired. The expectation was that the increased tidal prism created by the additional inundated lands would generally increase mixing of ocean salt into the Bay and Delta. The actual response was more complex. Modeling results suggest that Suisun Bay salinity would generally increase, extreme north and south Delta salinity would decrease, and western Delta salinity would increase or decrease, depending on the size and location of levee breaches and the nature of the tidal flux through the breach.

The CALFED Suisun Marsh Levee Sub-Team modeling analysis is intended to elucidate the mechanisms of the hydrodynamics and salinity response, and identify potential habitat restoration benefit linkages with levee integrity goals.

IEP DSM2 Project Work Team

DWR Suisun Marsh Planning staff hosted four Delta Simulation Model 2 (DSM2) project work team meetings during 1998. The mission of the team is to conduct a multiple agency consensus calibration of the DSM2 model by December 1999 for the Interagency Ecological Program. The group is firming up agreement on the approach for developing channel geometry, simulating open water areas, and validating the numerical models procedure. Suisun Marsh Planning staff have been working on incorporating the recommendations of the project work team.

Suisun Marsh Technical Advisory Committee

During 1998, DWR staff facilitated four Suisun Marsh Technical Advisory Committee (TECHCOMM) meetings. Meetings are scheduled quarterly to increase staff time and resource efficiency. Representatives from federal, state, and local agencies attended the meetings. Meeting announcements and summaries were distributed to more than 60 people, including SWRCB staff.

OPERATION AND MAINTENANCE

Suisun Marsh Salinity Control Gate Operation

The Suisun Marsh Salinity Control Gates (SMSCG) are operated from October 1 to May 31 as needed to meet salinity standards, and to minimize fish concerns related to predation and impedance. To date, the scheduling of SMSCG operation and the installation or removal of the flashboards have varied due to existing salinity conditions, fisheries agency requests for sensitive species concerns, or for special studies and repairs.

During the 1997-1998 control season, the SMSCG were operated from October 14 through December 3, 1998. Heavy precipitation in December, January and February lowered salinity throughout the Marsh making gate operations unnecessary for the rest of the control season. On February 3, 1998, the flashboards were removed due to concerns about Marsh flooding, and were not reinstalled until the 1998-1999 control season.

SMSCG operations were not needed to meet salinity standards during the first half of the 1998-1999 control season. The flashboards were installed at the end of September and the gates were operated intermittently during October and November, however, as part of a test to evaluate modified flashboards to

promote passage of adult salmon conducted jointly by DWR, USBR, DFG, SRCD, and NMFS. The operations were timed to coincide with the release of tagged adult salmon over two different time periods. The first operational period was from October 1 through October 12, with the normal flashboard configuration. The second or base case phase was from October 14 to October 26, when the gates were held open with the flashboards removed. The third operational period was from October 27 through November 12, when the gates were operated with the modified flashboards installed and to test the modified flashboard configuration (slots allowing a continuous passage opportunity). From November 13 through the end of the year, the gates were not operated although the modified flashboards were left in place to allow for further data collection.

In the course of the adult salmon migration portion of the test, the SMS CG operational data were closely scrutinized over the October-November study period. It quickly became apparent that the gates were not responding to opening/closing triggers the way they were intended. The most common problem was late gate openings, however there were incidences of late closings, and neither followed any discernable pattern. Since this problem occurred both before and after the modified flashboards were installed, it is believed that that the flashboard modification is not the cause of the gate malfunction. This timing problem prompted an investigation into operational procedures, including the proprietary software used to process operational data. The investigation is still in progress.

Morrow Island Distribution System Maintenance

Maintenance on Morrow Island Distribution System was initiated in 1997. At that time the distribution ditches were dredged, and the spoils were placed on the south levee including adjacent wetlands. In 1998, the dried spoils were used to rehabilitate the project levees, which were raised to design height.

Project maintenance and on site mitigation is approximately 90 percent complete. Additional remedial measures may be needed, including:

- Removal of 10 tons of aggregate material that spilled into the temporary spoils area (wetland),
- Revegetation of levee slopes, contingent on the success of the first year's seeding,
- Widening of specific sections of the north levee road to address safety concerns,
- Repairing the south levee road and vehicle turnout that were damaged during the removal of the excavator that rolled off the levee, and
- Replacement of eucalyptus trees that were removed to accommodate project activities (required by permit).

Roaring River Distribution System Maintenance

The Roaring River Distribution System (RRDS) was completed and became operational in 1980. Fish screens were installed and tested on two intake culverts in 1980, and on the remaining six culverts in 1983. In 1997, the slide gates on the eight intake culverts were automated to maintain the USFWS 0.2 feet per second fish screen velocity criteria.

During 1998, significant repairs were made to both the intake fish screens and the levee system. In October 1997, a routine inspection of the fish screens revealed a void 40 feet long by 4 feet deep below the base of the fish screen structure. In February 1998, floodwaters damaged a significant portion of the levee system (see below). Fourteen sites, totaling approximately 4 miles in length, were damaged significantly enough to require repair prior to operation of the distribution system.

All the environmental documentation required to begin the repairs was obtained by July 1998. The contractor began repair work on the levees and fish screen on August 31st and completed work on September 27th. Approximately 32,200 tons of fill material and 5,100 tons of aggregate base were used to restore the levees to pre-flood elevations. The voids below the fish screen structure were repaired using a combination of stone-slope protection, sack gabions and 3-inch rockfill. In addition, DWR's Delta Field Division placed an additional 200 tons of riprap along the waterside bank of the repaired areas to prevent erosion. The total cost of the repairs was approximately \$1.2 million shared by DWR, DFG, and USBR.

DWR plans to restore the entire RRDS levee system to design specifications. During 1998, surveys of the levee system were conducted and plans and specifications developed for the work. It is anticipated that the maintenance will be conducted during the summer of 1999.

SUISUN MARSH LEVEES

Suisun Marsh Flood Fight and Emergency Repairs

Heavy precipitation, high tides, and low atmospheric pressure during early February contributed to extensive flooding in Suisun Marsh. SRCD and DFG Grizzly Island reported 29 levee breaks or locations of overtopped levees during early February 1998. DWR and USBR funded repairs of the 11 most significant breaks. The U.S. Army Corps of Engineers repaired four areas, including two breaches and two overtopped areas. The remaining seven sites were repaired under contract with SRCD. The cost for the repairs was approximately \$1.1 million. An Incident Command Center was also established at the Suisun Resource Conservation District office on Grizzly Island to coordinate local flood fight efforts.

One of the breaches (San Souci) repaired by the USACE repeatedly breached after three attempts to repair it and was left open. One of the overtopped areas (RD 2127) experienced subsidence in June and July 1998 and was repaired by the Reclamation District. DWR Flood Management staff assisted in the wavewash protection effort during July.

Long Term Levee Maintenance Options

In February 1998, DWR and the USBR emphasized that the emergency levee repairs were in response to extraordinary circumstances and did not constitute a commitment for future responsibility for the repair and upkeep of privately owned levees, which is clearly stated in the Suisun Marsh Preservation Agreement.

Currently, only a small portion of Suisun Marsh levees are eligible for State funds for flood control projects under the Assembly 360 Delta Flood Protection Program. DWR has informed eligible local agencies of the AB 360 program and the application process.

However, the CALFED Bay-Delta Program has established the Suisun Marsh Levees Sub-Team to help decide if, and what portion of, Suisun Marsh levees should be included in the CALFED levees program. DWR's Suisun Marsh Branch staff is participating on the Levee Sub-Team, has completed a preliminary model study to evaluate the potential impacts of unrepaired Suisun Marsh levee breaches on Delta water quality, and reported its findings to CALFED.

MONITORING

Comprehensive Review of Suisun Marsh Monitoring Data

The Suisun Marsh Preservation Agreement and the Suisun Marsh Monitoring Agreement were signed in 1987 and outlined a monitoring program for data collection in the Suisun Marsh. These agreements also stipulated that the monitoring data and the effectiveness of the agreements were to be reviewed every five years. This review was not completed in 1992, and a "Comprehensive Review" of eleven years of data (water years 1985 through 1995) began in 1996. In addition to assessing the effectiveness of the agreements, this review is analyzing the data collected by the monitoring program. The monitoring program includes channel water salinity, as well as water quality and pond stage data from diked, managed wetlands in the Marsh. One task of the monitoring program was to collect data on the relationships between channel water salinity and pond and soil water salinity.

The analysis of the data was completed during 1998 and an in-house draft of the results was circulated for review. The final report is expected to be released in the summer of 1999.

Water Quality Monitoring and Compliance

Suisun Marsh channel water salinity standards were specified in SWRCB Order WR 95-6 for seven compliance stations. Four of these; National Steel (S-64), Beldons Landing (S-49), Volanti (S-42) and Sunrise (S-21), are located within the Marsh. A fifth, Collinsville (C-2), is located in the western Delta. DWR has requested that the two remaining sites, Morrow Island (S-35) and Ibis (S-97) located in the western Marsh, be converted to monitoring stations due to the small degree of control the state water project has on salinity levels at these locations. In the meantime, a variance has been granted for all compliance stations to allow for testing the SMSCG modified flashboards (see SMSCG Flashboard Modification Study, page 16). The variance is effective through May 31, 2001.

Flow monitoring continued at two tributary locations (S-10 and S-16). Data collected at these locations are used as boundary conditions in computer simulation models used by the department to analyze and forecast salinity levels within the Marsh. These modeling studies are used to help determine alternative methods of achieving salinity standards in the marsh during dry periods.

A number of repairs and upgrades were completed during 1998. Discharge monitoring station S-16 (Suisun Creek) was constructed to replace S-15, which was washed away by high floodwaters in January of 1997. Major repairs to existing stations included tide well stabilization and structural repairs to equipment housing units and access features. Other equipment changes included installation of electronic data recorders at S-37, C-2, S-54 and S-16. Tidal stage was added to the data collected at S-4. One site (S-90) was de-activated.

Vegetation Monitoring

Under the SMPA, DWR and USBR are required to conduct a vegetation survey of the Suisun Marsh every three years. In 1997 a one-year delay was agreed upon to re-evaluate and update the field and imaging methodologies.

A field reconnaissance was conducted to help develop a new survey methodology, and aerial photos were taken in June. DFG's Wildlife Habitat and Analysis Branch is in the process of preparing a final proposal for a survey methodology. The next vegetation survey is scheduled for summer 1999.

Wildlife Monitoring

Salt Marsh Harvest Mouse Trapping and Habitat Surveys

In 1981, the U.S. Fish and Wildlife Service issued a Biological Opinion for the Suisun Marsh Plan of Protection (USFWS 1981). In the Biological Opinion the Service expressed concern that the implementation of the Plan and more intensive management practices on both State and private wetlands could result in the reduction of preferred salt marsh harvest mouse (SMHM; *Reithrodontomys raviventris halicoetes*) habitat. To compensate for this potential loss, the USFWS required the following conservation measures:

- Mapping of baseline acreage of preferred SMHM habitat using the 1981 triennial vegetation survey flight. A change in preferred habitat was to be considered significant when the acreage decreased by one-third in any of five zones during subsequent flights. If losses were detected, management plans were to be modified to assure that substantial tracts of preferred habitat were retained, and that any degraded habitat was restored.
- Retention and monitoring of at least 2,500 acres of preferred SMHM habitat adequately distributed throughout the marsh.
- Approximately 1,000 acres of State lands, and appropriate portions of future acquisitions, are to be set aside and managed as preferred SMHM habitat.
- Development of comparable amounts of habitat to compensate for the loss of 340 acres of wetland, including 100 acres of SMHM habitat. The 100 acres is to be managed as preferred SMHM habitat.

To date, a baseline assessment of SMHM preferred habitat has not been finalized, and the 2,500 acre goal has not been reached.

The Department of Fish and Game has set aside seven areas totaling 1,078 acres, as well as the Peytonia Slough Ecological Reserve (150 acres), as preferred SMHM habitat in Suisun Marsh. The management plan for these areas includes:

- management of water and habitat areas set aside as SMHM habitat,
- future acquisitions of SMHM habitat,
- monitoring to establish baseline conditions of the seven set-aside areas,
- ongoing monitoring of the vegetation and SMHM populations of the seven areas, including annual surveys along permanent vegetation transects and

SMHM surveys every three years in conjunction with a marsh-wide triennial vegetation survey, and

- a project review.

In 1998, the signatories to the SMPA formed an Environmental Coordination Advisory Team (ECAT) to assure future compliance with permit and monitoring requirements. The ECAT is currently working with the U.S. Fish and Wildlife Service to meet the requirements and implementation is proceeding.

Monitoring to determine whether the SMHM is present on the 1,078 acres of mitigation land was conducted in August and September 1998. In addition to the seven set-aside areas, the Peytonia Slough Ecological Reserve was also trapped. One hundred live-traps were set in areas of best available habitat at each of the seven set-aside areas for three consecutive nights.

Salt marsh harvest mice were caught at six of the eight areas trapped. SMHM were not captured at two tidal areas (Hill Slough East and Joice Island), where the pickleweed habitat appeared to be less than ideal. The 1998 flooding appears to have affected populations of the SMHM on Grizzly Island, judging from lower numbers of mice caught afterwards.

Suisun Marsh Waterfowl Feeding Ecology Study

The second and final field season of the Suisun Marsh Feeding Ecology Study was completed December 31, 1998. A total of 115 birds were collected including 49 mallards, 34 northern pintails, and 22 green-winged teal. Habitat data were collected from 20 different feeding sites throughout the Marsh. Members of 24 privately owned managed wetlands in the Marsh contributed esophagi from their birds. Over 200 samples have thus far been turned in from the private clubs. In addition, esophageal collection was begun at the DFG Grizzly Island check station this year. Hunters on DFG ponds proved to be very cooperative, contributing over 350 additional samples to the study. In 1997, a total of 118 birds were collected: 52 mallards, 45 northern pintails, and 21 green-winged teal. Habitat data were collected from 26 feeding sites and 18 duck clubs from throughout the marsh contributed over 200 samples.

Laboratory work at UC Davis is in progress. Esophageal contents from the 1997 collected birds and approximately half of the 1997 contributed club birds have been sorted, dried, weighed, and are currently being summarized and analyzed. Due to time constraints, feeding site core samples from all 26 1997 feeding sites have been sub-sampled and are currently being analyzed to determine necessary sub-sample sizes. Laboratory sorting and analysis will continue until the final report is issued in the fall of 1999.

Fisheries Monitoring

During 1998, the DWR contracted with UC Davis and DFG to conduct fisheries monitoring in Suisun Marsh. The monitoring was conducted to meet U.S. Army Corps of Engineers and San Francisco Bay Conservation and Development Commission permit requirements for construction and operation of the Suisun Marsh Salinity Control Gates.

UC Davis has sampled for fish in Suisun Marsh since 1979, with DWR and USBR funding. During 1998, sampling continued as in previous years. Results from 1998 sampling will be available by spring 1999. Data from the 1997 sampling indicate that the long-term population fluctuation at lower levels continues. The decline seems independent of SMSCG operation. Since 1988, introduced species have dominated the fisheries community. The presence of eggs and larvae of delta smelt and longfin smelt indicates that these species used the Marsh for spawning and rearing in 1994-1997, while splittail larva were only captured in 1995 and 1996.

DFG has monitored *Neomysis mercedis* densities and chlorophyll *a* concentration, an indicator of phytoplankton abundance, in the Marsh since the late 1970's. In 1997 *N. mercedis* and chlorophyll *a* sampling was conducted monthly throughout the year. *N. mercedis* has been declining in Suisun Marsh since the 1970's, with the most dramatic decreases evident after 1991. In 1997, abundance continued at low levels. Food limitation, caused by reduced phytoplankton abundance, is the most probable cause for the decline. Overall, chlorophyll *a* concentration has decreased in Suisun Marsh since 1987. The decline has been attributed to the presence of *Potamocorbula amurensis* and to decreases in freshwater flows during drought years. In 1997, chlorophyll *a* concentrations were low and at similar levels to 1996. Construction and operation of SMSCG does not appear to have further decreased chlorophyll *a* levels. Results from 1998 sampling will be available in mid-1999.

DFG biologists conducted striped bass egg and larva sampling in Suisun Marsh from 1984-1988 and from 1993-1995. From 1984-1988 (years before SMSCG were installed), striped bass eggs and larvae in Montezuma Slough comprised 0.04-0.20% of the total eggs and larvae in the Delta. In 1994, abundance in Montezuma Slough comprised 0.28% of total egg and larval abundance in the Delta. This was similar to levels seen in years prior to the SMSCG installation. Larvae collected in 1995 were not measured and consequently, biologists were not able to calculate abundance indices. Based on the limited data available, it appears that the gates are not affecting striped bass egg and larval development in Suisun Marsh.

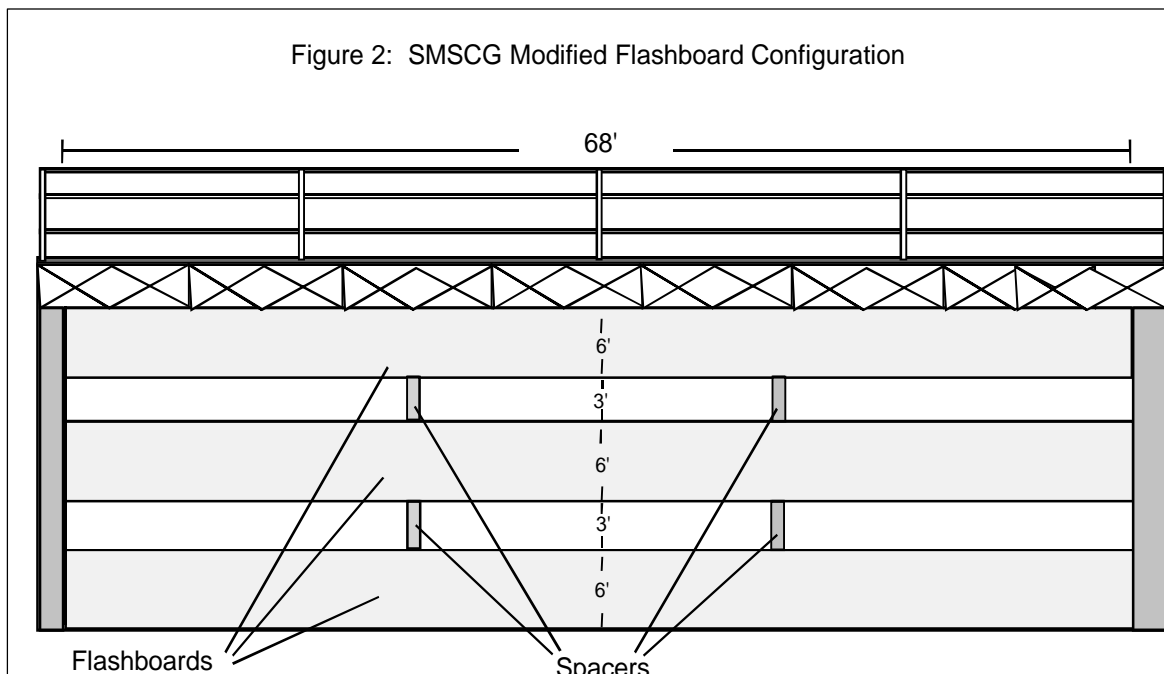
DFG researchers also conduct sampling for juvenile striped bass (defined as schools of fish with mean length from 17.8 mm to 38.1 mm) in Suisun Marsh. In

1997, abundance in Montezuma Slough was the lowest measured in the last 10 years. A gradual decrease in the average abundance has been observed in the Delta and Montezuma Slough since sampling began in 1959. Since the decrease has been relatively constant over the last 30 years, it is unlikely that changes in abundance were due to installation and operation of SMSCG.

MITIGATION AND FULLFILLMENT OF PERMIT CONDITIONS

SMSCG Flashboard Modification Study

In 1993, DWR convened a technical advisory group of interagency biologists referred to as the SMSCG Steering Group. The group consists of biologists from DWR, DFG, USBR, USACE, NMFS, USFWS, and SRCD, is charged with recommending, designing, and reviewing monitoring studies and results to ensure DWR and USBR meet USACE permit requirements for SMSCG operations. In 1998, the SMSCG Steering Group developed a recommendation to minimize the delay/blockage for adult salmon at the gates, while continuing to meet channel water salinity standards in Suisun Marsh. The recommendation was based on results from the 1993 and 1994 Adult Salmon Migration Studies, a population level evaluation of the potential impacts of gate operation, and a report proposing several ways to minimize delays at the SMSCG. The SMSCG Steering Group evaluated the measures to minimize delays for adult salmon passage based on their impacts to salinity and their probability of increasing salmon passage. The group chose to install a dual three-foot horizontal slot (Figure 2) in the flashboard portion of the structure. A three-year study was



designed to evaluate the effectiveness of the slots at providing passage for adult salmon and resulting changes in salinity. The first year of the study began in the fall of 1998. An interim report is expected in 1999. Eventually, fisheries and salinity data from all three years of the program will be evaluated by the SMSGC Steering Group to determine whether the modification is a success.

Morrow Island Distribution System Maintenance Project

Two primary mitigation measures were required under the conditions of the permit for the MIDS project. These requirements are: (1) the establishment of 57 acres of salt marsh harvest mouse habitat to mitigate for approximately 19 acres of habitat temporarily disturbed during maintenance, and (2) the installation of a fish screen at the intake of the distribution system to mitigate the impacts on delta smelt during the project, and to reduce impacts on that species during future system operations.

The off-site mitigation area has been located and approved by DWR, DFG, USACE, and USFWS. Fifty-seven acres of salt marsh harvest mouse habitat will be created on the island slough property, in addition to the 100 acres that is currently being created.

The fish screen that is to be added to the distribution system's intake is currently being designed, and the design approved.

REPORTS

Suisun Marsh Annual Data Summary Reports

The data summary reports for water years 1995 and 1996 were released in 1998. The reports review information collected during channel water salinity monitoring, waterfowl surveys, salt marsh harvest mouse surveys, and fish studies.

The results of monitoring activities in the Marsh during water year 1997 will be available in spring of 1999. The report format has been revised from previous years. Most of the background information, such as legislative history and general Suisun Marsh hydrology has been removed and placed in a separate document entitled *Suisun Marsh Monitoring Program Data Summary Report Reference Guide*. The *Reference Guide* will provide comprehensive background information on the DWR Suisun Marsh monitoring program. This document is referenced in the *Annual Data Summary* report and will be available on the Internet, or by request. The intent is to streamline the report preparation process for future years. The *Reference Guide* will be available concurrently with the data report.

Suisun Marsh Salinity Control Gates Fisheries Monitoring Annual Report

The Suisun Marsh Salinity Control Gates Fisheries Monitoring Annual Reports for water years 1996 and 1997 are in preparation and due to be released soon. The 1996 annual report is currently in press, and the 1997 report is expected to be released summer of 1999.

Draft Environmental Assessment/Initial Study for Amendment Three to the Suisun Marsh Preservation Agreement (June 1998).

See Amending the Agreement, page 1.

Suisun Marsh 73-Year Model Study in Support of SWRCB Draft EIR for Implementing the Water Quality Control Plan of the San Francisco/Sacramento-San Joaquin Delta Estuary (November 1997).

See SWRCB 1995 Water Quality Control Plan Draft Environmental Impact Report, page 6.

Demonstration Document: Suisun Marsh Preservation Agreement Amendment Three Actions as a Means to Provide Equivalent or Better Protection at Suisun Marsh Stations S-35 and S-97 (April 1998).

The purpose of the Demonstration Document was to demonstrate that the management actions in the proposed Suisun Marsh Preservation Agreement Amendment Three would provide equivalent or better protection than the channel water salinity standards for western Suisun Marsh stations S-35 and S-97 specified in the 1995 Bay/Delta Plan.

SUISUN MARSH EXPENDITURE HISTORY

Suisun Marsh expenditures and reimbursements administered by DWR for calendar years 1968 through September 1998 are summarized in Table 1 and Figure 3.

From 1968 through September 1998, DWR disbursed over \$84 million of SWP funds for planning, design, environmental documentation, construction, maintenance, monitoring, mitigation and permit compliance in support of implementing the *Plan of Protection for the Suisun Marsh* and the *Suisun Marsh Preservation Agreement*, and meeting standards set by the SWRCB. USBR has reimbursed DWR about \$32.8 million (39.1%), and the California General Fund has reimbursed about \$9.5 million (11.3%). These figures do not include up-front payments made by USBR for staff and other direct costs, as well as, about \$5.7 million in USBR interest payments during 1988 and 1989.

Annual figures are reported in Table 1 for DWR up-front payments, USBR reimbursements, General Fund reimbursements, and DWR's cumulative expenditure balance.

| CalendarYear | DWR Upfront Payment | USBR Reimbursement | General Fund Reimbursement | Cumulative DWR Expenditure Balance (CXB) ^{1/} |
|--------------|-----------------------------------|-------------------------------------|----------------------------------|--|
| 1968 | \$10,571 | \$0 | \$0 | \$10,571 |
| 1969 | \$34,182 | \$0 | \$0 | \$44,753 |
| 1970 | \$23,343 | \$0 | \$0 | \$68,096 |
| 1971 | \$1,042 | \$0 | \$0 | \$69,138 |
| 1972 | \$47 | \$0 | \$0 | \$69,185 |
| 1973 | \$0 | \$0 | \$0 | \$69,185 |
| 1974 | \$0 | \$0 | \$0 | \$69,185 |
| 1975 | \$2,709 | \$0 | \$0 | \$71,894 |
| 1976 | \$32,961 | \$0 | \$0 | \$104,855 |
| 1977 | \$37,475 | \$0 | \$0 | \$142,331 |
| 1978 | \$350,831 | \$0 | \$0 | \$493,162 |
| 1979 | \$3,660,096 | \$0 | \$0 | \$4,153,258 |
| 1980 | \$5,005,759 | \$0 | \$0 | \$9,159,017 |
| 1981 | \$2,964,977 | \$0 | \$0 | \$12,123,995 |
| 1982 | \$2,955,702 | \$2,500,000 | \$0 | \$12,579,697 |
| 1983 | \$2,754,091 | \$0 | \$0 | \$15,333,788 |
| 1984 | \$2,418,345 | \$0 | \$0 | \$17,752,133 |
| 1985 | \$2,332,776 | \$0 | \$0 | \$20,084,909 |
| 1986 | \$6,495,323 | \$0 | \$0 | \$26,580,232 |
| 1987 | \$13,600,701 | \$0 | \$0 | \$40,180,933 |
| 1988 | \$7,456,364 | \$17,368,725 ^{9/} | \$0 | \$30,268,572 |
| 1989 | \$2,341,843 | \$1,219,691 ^{10/} | \$9,478,000 ^{2/} | \$21,912,724 |
| 1990 | \$3,030,016 | \$695,450 | \$0 | \$24,247,290 |
| 1991 | \$6,222,531 | \$2,925,429 | \$0 | \$27,544,392 |
| 1992 | \$2,737,242 | \$1,174,655 | \$0 | \$29,106,978 |
| 1993 | \$2,979,254 | \$238,130 | \$0 | \$31,848,102 |
| 1994 | \$3,192,211 | \$1,962,549 | \$0 | \$33,077,764 |
| 1995 | \$2,721,197 | \$647,138 | \$0 | \$35,151,823 |
| 1996 | \$3,391,094 | \$1,482,396 | \$0 | \$37,060,522 |
| 1997 | \$3,631,783 | \$1,520,219 | \$0 | \$39,172,086 |
| 1998 | \$3,675,801 ^{7,8/} | \$1,107,501 | \$0 | \$41,740,386 |
| 1999 | \$0 | \$0 | \$0 | \$0 |
| 2000 | \$0 | \$0 | \$0 | \$0 |
| Total | \$84,060,269 ^{3/} | \$32,841,883 ^{3,4/} | \$9,478,000 ^{5/} | \$41,740,386 ^{6/} |

1/ CXB = (Previous Year's CXB + DWR Upfront Payment) - (USBR + General Fund Reimbursements)

2/ Under State Assembly Bill 1442, the General Fund paid 20% of DWR's Upfront Payment through June 1988, amounting to \$9,478,000. This payment includes \$6,643,600 for our Recreation project purpose share of 14%.

3/ Does not include USBR upfront payments for staff and other direct costs.

4/ USBR has paid 39.6% of the total DWR Upfront Payment.

5/ General Fund has paid 11.6% of the total DWR Upfront Payment.

6/ DWR has paid 48.8% of the total DWR Upfront Payment.

7/ Includes January through September 1998

8/ For years 1999 to 2000, figures will be included when available.

9/ USBR paid an additional \$5,111,831 as interest in 1988 not shown in the table.

10/ USBR paid an additional \$607,175 as interest in 1989 not shown in the table.

Figure 3: Summary of DWR Expenditures and Reimbursements as of September 1998 (year specific dollars)

